
Appendix A Bridge widths and clearances

In this section

	Section	Page
A1	General	A-2
A2	Bridge deck widths	A-6
A3	Vertical and horizontal clearances	A-11
A4	References	A-13

A1 General

A1.1 General

- a. In assessing the appropriate width for a structure, a designer should take into account its context and purpose, as well as its value for money. Consideration should be given to its current and future use, particularly in catering for vulnerable users and connectivity to the surrounding network.
- b. As a general principle, the widths of traffic lanes and shoulders, together with any additional facilities for pedestrians, cyclists and equestrians on a bridge shall be consistent, wherever practicable, with those of the road on the approaches. This also applies where roads cross over culverts, stock underpasses and subways. Where there are variations, the transitions between these shall be effected at a rate appropriate to the speed environment in order to minimise the impact on the lane edge-line and driving alignment.
- c. Typical bridge deck details for various one and two-lane situations are illustrated in figure A1. These details are indicative and should be considered as guidance when considering the site specific constraints of individual cases. They apply both to bridge decks and to the roof slab of culverts, stock underpasses and subways that are not buried but directly carry the road carriageway.
- d. The geometric requirements presented in tables A1 to A6 and figures A1 and A4 apply to state highways and may apply to non-state highways. Any variation from these requirements shall be at the discretion of the road controlling authority.
- e. The 'desirable' values given in the tables are generally preferred but partial or full reductions to the 'minimum' values may be acceptable based on value for money.

The preparation of the business case and the structure design statement shall take account of all relevant factors and provide a balanced value for money assessment to provide the optimum outcome for the project. This assessment could include different options for a decision by the road controlling authority.

Further information on the derivation of the desirable values and the appropriate process is provided in the guidance notes in A2(c).

- f. The 'minimum' values given in the tables are the lowest acceptable value for a dimension or parameter. These values should be exceeded wherever practicable.
- g. Specific consideration shall be given to providing for cyclists, over and above the requirements of pedestrians. (Refer to the Austroads *Guide to road design* part 3 Geometric design⁽¹⁾.)

A1.2 Medians

- a. Where the traffic lanes are separated by a median, it is desirable that the widths of the median and the type and level of protection provided by a safety barrier within the median are consistent with the approaches to the bridge.
- b. Where the requirements of (a) are not practicable, the width of the median may be varied provided that the tapers applied to any changes in width are consistent with the speed environment and provide a smooth driving alignment.

A1.3 Use of kerbs on bridges

A1.3.1 General

- i. Kerbs should only be used if any of the following apply:
 - As a continuation of a kerb on the approach with matching profile type. Note that a kerb on the bridge has a maximum height of 100mm and therefore a transition may be required from the approach kerb.

A1.3 continued

- As delineation for a footpath.
 - To provide control of surface water.
- ii. Examples of common kerb profiles are shown in figure A2.
 - iii. Kerb height should be limited to a maximum of 100mm (channel lip to kerb top) so that they do not adversely affect the performance of the edge protection or interfere with bicycle pedals.
 - iv. Where a kerb is required adjacent to a road safety barrier, in order to avoid adverse effects on the barrier performance, it is desirable that the vertical face of the kerb be placed vertically below the barrier face. If this is not practical, notwithstanding the requirements of (v), then the vertical face of a vertical or semi-mountable kerb should be no greater than 200mm in front of the face of the barrier. This restriction does not apply to the location of fully mountable kerbs.
 - v. Where a kerb is provided adjacent to a footpath
 - in >50km/h
 - o A mountable profile is preferred and must be used where the edge protection is semi-rigid.
 - o A semi-mountable kerb may be used where the edge protection is rigid.
 - o A minimum offset of 1.5m must be provided from the kerb face to the face of the edge protection.
 - o For a single lane bridge, the footpath may be reduced to 1.0m provided that the kerb does not have a vertical profile.
 - in ≤50km/h
 - o A vertical profile may be used where it is present on the approaches.

A1.3.2 Barrier kerbs

- i. 'Barrier kerb' is the term traditionally applied only to the kerb whose profile approximates to that given in B2.7.
- ii. Barrier kerbs shall not be used on new structures. They may only be used on existing structures in exceptional circumstances with the agreement of the road controlling authority. Historically, they were intended to provide additional restraint to errant vehicles where the side protection was inadequate.

A1.4 Side protection

The distance from the face of a non-rigid traffic barrier to the deck edge is required to accommodate the designed deflection of the barrier under vehicle impact and keep the vehicle wheels on the deck, as described in table A2. On single-lane bridges only the distance may be reduced to 270mm for semi-rigid barriers (figure A1 - types 3 and 4), where the slab is sufficiently deep for the barrier posts to be fixed to the side of the deck. This is on the basis that the vehicle impact angle will usually be smaller due to the restricted width of carriageway, resulting in smaller barrier deflections.

Where there is a footpath (or combined facility catering for more than one of pedestrians, cyclists and equestrians), there are two options:

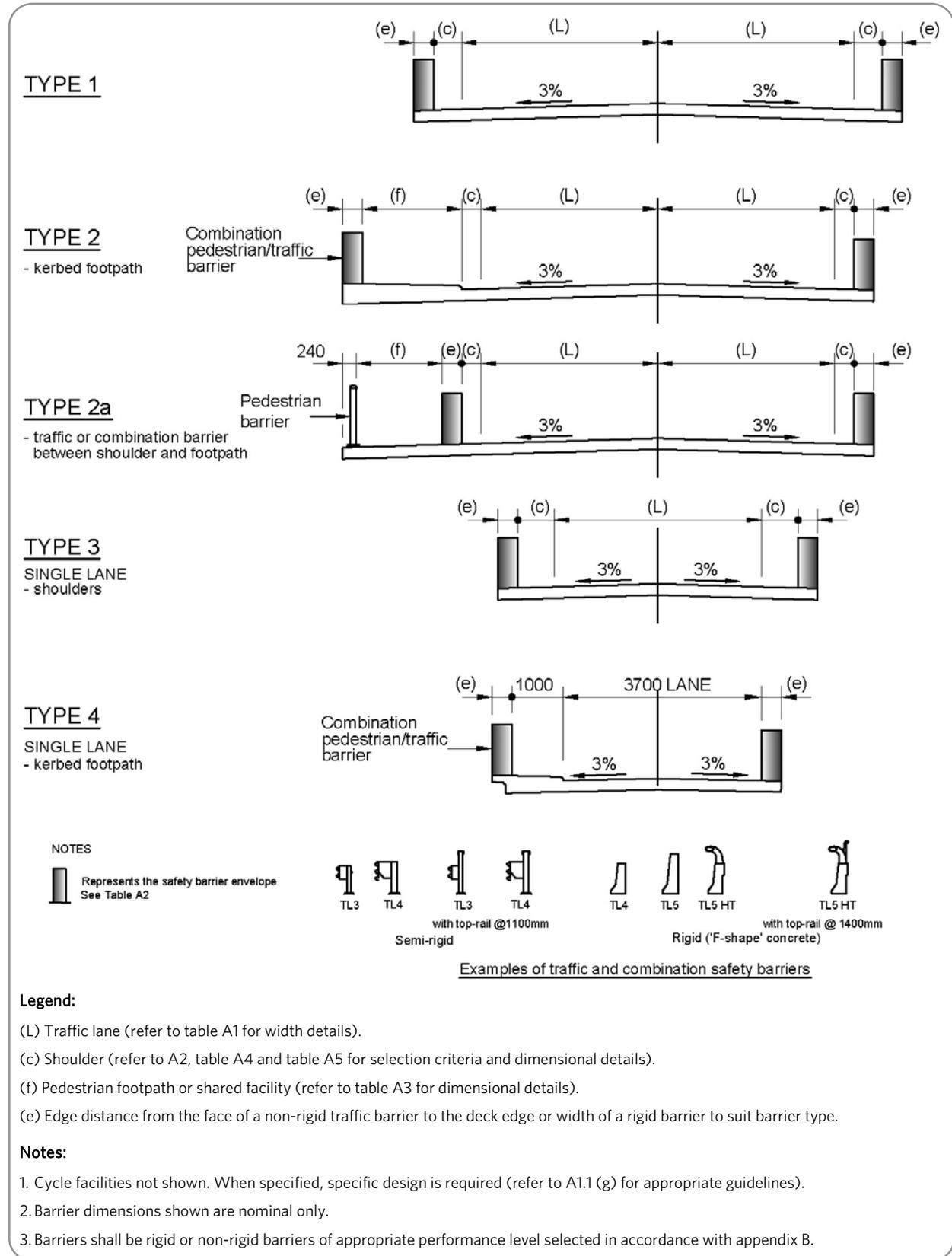
- i. to use a kerb between the shoulder and the footpath (or combined facility) and a combination barrier (traffic safety barrier with an appropriate top-rail) at the edge of the deck.
- ii. to place a traffic barrier between the shoulder and the footpath (or combined facility) with a pedestrian (cyclist or equestrian) barrier at the edge of the deck.

Option (i) is the normal arrangement. Option (ii) should be considered where there is likelihood of prolonged pedestrian presence or the alignment of the bridge increases the risk of a vehicle losing control (eg outside of curves).

A1.4 continued

Where the traffic barrier is placed between the shoulder and the footpath, consideration should be given to providing additional height protection. Furthermore, careful consideration should be given to the termination of these barriers off the bridge.

Figure A1: Typical bridge deck details



A1.5 Footpath

The term 'path' has been used to refer to facilities for the exclusive or shared use of pedestrians, cyclists and equestrians. This differs from the Austroads *Glossary of terms*⁽²⁾ in respect of facilities on bridges.

The need to cater for pedestrians, cyclists and equestrians on a bridge shall generally be determined at scheme assessment stage, according to the local and regional pedestrian, cycle and equestrian demand. The width of these facilities shall be as defined in table A3.

A footpath behind a non-rigid barrier may be reduced in width at the posts, on the basis that this maintains clearance to the rear of the barrier rail.

The minimum width of combined facilities should be consistent with that of the approaches to the bridge. This may be increased to cater for future demand.

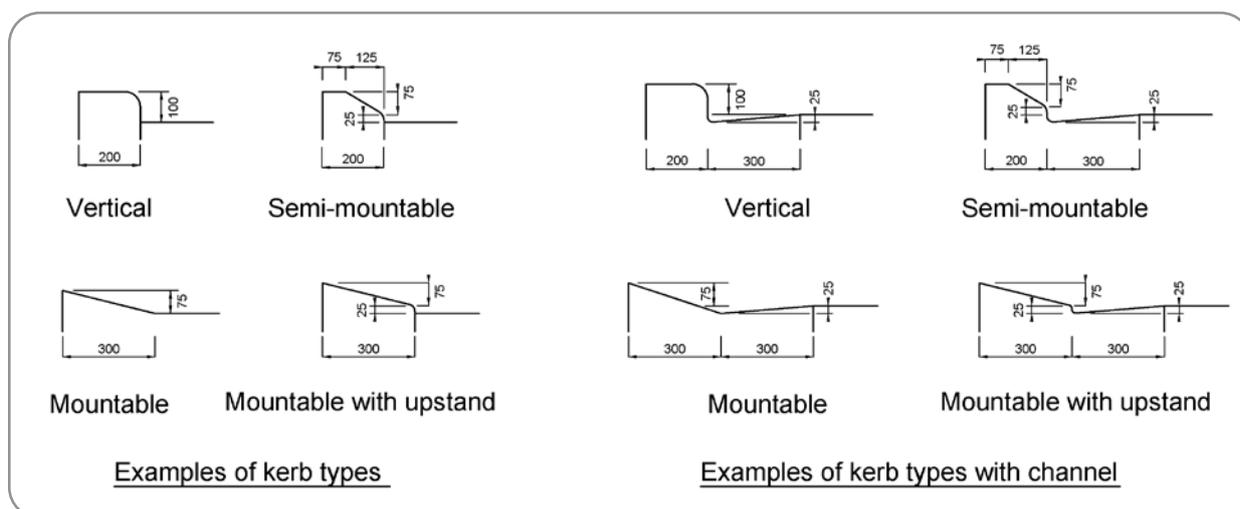
Further guidance on provisions appropriate for pedestrians, cyclists and equestrians may be found in the following publications:

- For pedestrians and cyclists:
 - Austroads *Guide to road design* part 3⁽¹⁾ and part 6A Pedestrian and cyclist paths⁽³⁾.
- For equestrians:
 - TA 91 *Provision for non-motorised users*⁽⁴⁾.
 - TA 90 *The geometric design of pedestrian, cycle and equestrian routes*⁽⁵⁾.

A1.6 Bridges for non-motorised users

For a dedicated pedestrian/cycling/equestrian bridge, the width should be appropriate for the required and anticipated network demand. A clear width of 3.0m is considered desirable for a shared facility.

Figure A2: Examples of typical kerb profiles for bridges



A2 Bridge deck widths

- a. Deck width is the sum of the individual elements required to make up the desired bridge cross-section. A flowchart to aid in the determination of bridge widths is shown in figure A3. Bridge carriageway requirements are:
- i. Full approach road carriageway
The full width of the approach traffic lanes and shoulders required for a road carrying the expected AADT (annual average daily traffic) 30 years ahead shall be provided across bridges unless otherwise agreed by the road controlling authority.
 - ii. All other situations
The carriageway width required shall be determined by the minimum traffic lane width given in table A1. Note that traffic lanes may need to be widened on curved bridges to accommodate the tracking widths required by large commercial vehicles.
Edge clearances are selected using the following criteria:
 1. Provide kerbs, shoulders and footpaths on the structure consistent with the approach road cross-section;
 2. Where a segregated (off-road) pedestrian, cycle or equestrian facility is provided on the approach, this segregation should desirably be continued over the bridge (figure A1 - type 2a).
 3. Where an approach footpath is contiguous with the carriageway or shoulder on the approach, the edge treatment (kerb) shall desirably be continued across the bridge (figure A1 - type 2).
 4. The kerb face or channel low point shall be placed at the back of the shoulder (ie the width of the kerb is part of the footpath and the width of the channel is part of the shoulder).
 5. Where the anticipated usage of the path is high, it will be used by vulnerable users or will be a shared facility, preference should be given to inserting a barrier between the footpath or shared path and the shoulder (figure A1 - type 2a). In this case, specific consideration should be given to the treatment of the barrier terminals beyond the bridge and to maximising dimension (c) to allow additional clearance for cyclists. Note that an additional barrier is required on the outside of the path that should be appropriate for the usage (eg pedestrian barrier 1.1m high, cyclist barrier 1.4m high, equestrian barrier 1.8m high).
 6. Where there is neither kerbing nor footpath on the approach road then clearance between a safety barrier and the adjacent traffic lane shall be provided in accordance with table A5.
- b. The carriageway widths required for standard, straight, 2 x 3.5m lane, state highway bridges relating to the traffic volume from A2(a)(i) and (ii), are summarised in table A6. Note that for AADT <2000 vehicles per day (vpd), the current standards for approach carriageway widths may be less than those recommended for bridge widths.
-

A2 continued

c. Guidance notes

The philosophy applied to the process used to establish the deck width has been changed to be more consistent with the rest of the highway network. Essentially, the designer should take into account the amenity provided by the road cross section on each side and at both ends of the structure and the need for future-proofing.

For example, if a rural highway has a typical cross-section of 3.5m lanes and 1.5m shoulders, without kerbs or any specific facilities for pedestrians then this will be the default cross-section over the structure. If there is a kerb on the approach however, it would be prudent to establish why the kerb is there in the first place (eg surface water control or delineation – particularly if there is a footpath or shared path). The kerb should then either be continued over the bridge or aligned with the barrier system appropriately.

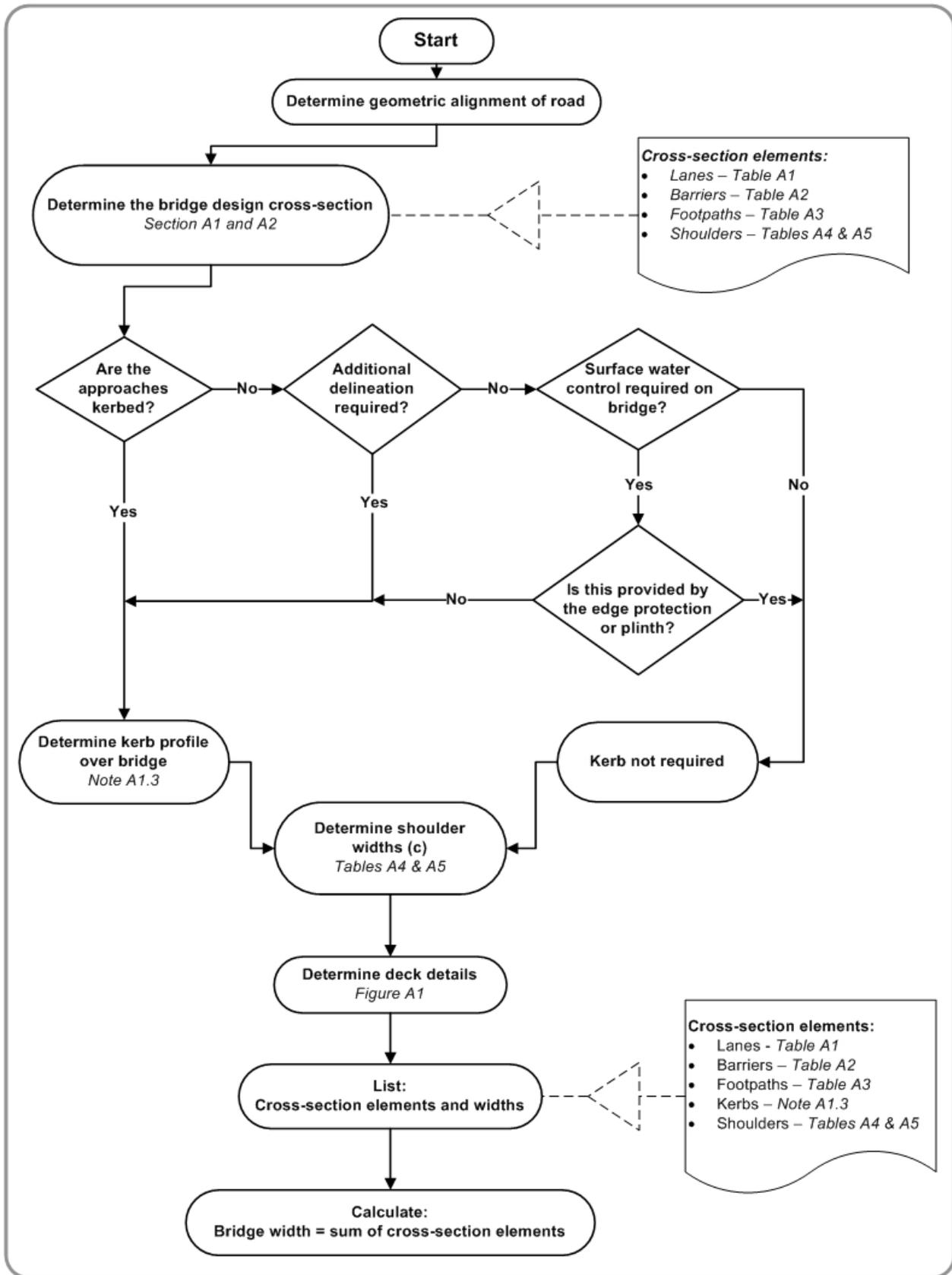
Consideration should also be given to future-proofing the structure, particularly in respect of pedestrians in line with local authority policy. If a footpath is to be provided on one or both sides of the structure, then this will usually be delineated by a mountable or semi-mountable kerb. If this is just a footpath, then the desirable shoulder width should be considered in order to cater for cyclists. If this is to be a shared path, then it will usually be wider than just a footpath and a mountable kerb would be preferred to ensure user safety. The minimum shoulder width may be considered appropriate for shoulders adjacent to shared paths.

If the shared path is two-way, or where the pedestrian or cyclist traffic may be tempted to stop on the structure (eg a lookout), then consideration should be given to separating this facility from the highway by placing a road safety barrier system at the back of the shoulder. This barrier system may have a pedestrian or cycle rail added as required. Careful consideration should be given to the barrier system terminal end details to ensure that the required protection of the roadside hazard is continuous on the bridge approaches. This configuration should be considered where there an 'off-road' facility that uses the structure to cross a hazard even if this facility is not adjacent to the highway on the approach.

Table A1: Traffic lanes

Description	Width (L)
The width of traffic lanes shall be as specified in the Austroads <i>Guide to road design</i> Part 3 ⁽¹⁾ section 4.2.4 unless specified otherwise by the road controlling authority. Good geometric design practice including curve widening criteria to accommodate heavy vehicle tracking (particularly relevant to low radius horizontal curves) should be applied to determine appropriate bridge and approach traffic lane widths.	3.50m (desirable)

Figure A3: Flowchart to determine bridge width



A2 continued

Table A2: Bridge barriers

Element	Horizontal dimension (e)
Rigid traffic barrier (actual dimension governed by barrier system employed)	400mm (TL-4 monolithic 915mm high) 450mm (TL-5 HT type 1270mm high) (nominal)
Inside face of pedestrian barrier to edge of deck (top fixed)	240 mm (minimum)
Traffic face of semi-rigid safety barrier to edge of deck (top fixed) - based on nominal test deflection	800mm (TL-3 W-beam) 900mm (TL-4 Thrie-beam) (minimum)

Table A3: Bridge footpaths

Footpath width	Horizontal dimension (f)
In general situations:	
– desirable	2.00m
– shared desirable (pedestrian and cyclist and/or equestrian)	2.50m
– minimum (with kerb)	1.50m
– minimum (without kerb)	1.30m
Behind a semi-rigid barrier post	
– desirable	1.70m
– minimum	1.00m

Table A4: Clearances between kerbs and adjacent traffic lanes (shoulder widths)

Kerb type on approach	Kerb type on bridge	Shoulder width (c)
Kerbed	Preferred mountable or semi-mountable to match approach	See table A5
	Vertical kerb - to match approach road kerb only in speed environment of 50km/h or less ¹	1500mm desirable (600mm minimum)
No kerb	No kerb (preferred) or mountable	See table A5

Notes:

- Where a kerb is not present on the approach, the preference is to not have a kerb over the bridge. However, if one is required for delineation or control of surface water then a mountable profile should be used.
- Where a kerb is used, the face of kerb should be placed at the back of the shoulder
- Desirable width should be used for cyclist safety
- For cycle facilities refer to A1(f).

A2 continued

Table A5: Clearances between bridge safety barriers and adjacent traffic lanes (shoulder widths)

For use only where the approach road cross-section cannot be continued over the structure or the shoulder width on the approach is less than the desirable value.

Road type		Shoulder width (c)
Low volume one-lane or two-lane roads (AADT <500)		600mm desirable 300mm minimum
Medium volume two-lane roads:		
– AADT 500 - 2000		750mm desirable 600mm minimum
– AADT 2000 - 4000		1000mm desirable 600mm minimum
High volume two-lane roads (AADT >4000)		1500mm desirable 1200mm minimum
Divided roads and motorways	Nearside (LHS)	2500mm desirable 1200mm minimum
	Median (RHS)	1600mm desirable ^{8,9} 600mm minimum

Notes:

- Traffic volumes are expected AADT 30 years ahead.
- Desirable clearances shall apply where the approach road cross-section cannot practicably continue over the bridge or the shoulder widths on the approaches are less than the desirable value.
- Minimum clearances should only be used in extreme conditions, ie where it is physically impracticable to provide the normal clearance. There should be compelling reasons documented to justify the use of reduced clearances.
- For cycle facilities refer to A1(f).
- Clearances apply where shown in figure A1.
- Clearances should be increased on the inside of curves as required to provide the appropriate sight distance.
- Clearances do not satisfy shy-line requirements to Austroads *Guide to road design part 6 Roadside design, safety and barriers*⁽⁶⁾ table 6.4.
- Based on a rigid barrier.
- Where split structures are used for dual carriageways, the desirable shoulder width shall be used at the right hand edge of the running lane.

Table A6: Two-lane state highway bridge carriageway widths

AADT (vpd)	Desirable carriageway width (m)		Minimum carriageway width (m)	
>4000	10.0	(2x3.5 + 2x1.5)	9.4	(2x3.5 + 2x1.2)
2000 - 4000	9.0	(2x3.5 + 2x1.0)	8.2	(2x3.5 + 2x0.6)
500 - 2000	8.5	(2x3.5 + 2x0.75)	8.2	(2x3.5 + 2x0.6)
<500	8.2	(2x3.5 + 2x0.6)	7.6	(2x3.5 + 2x0.3)

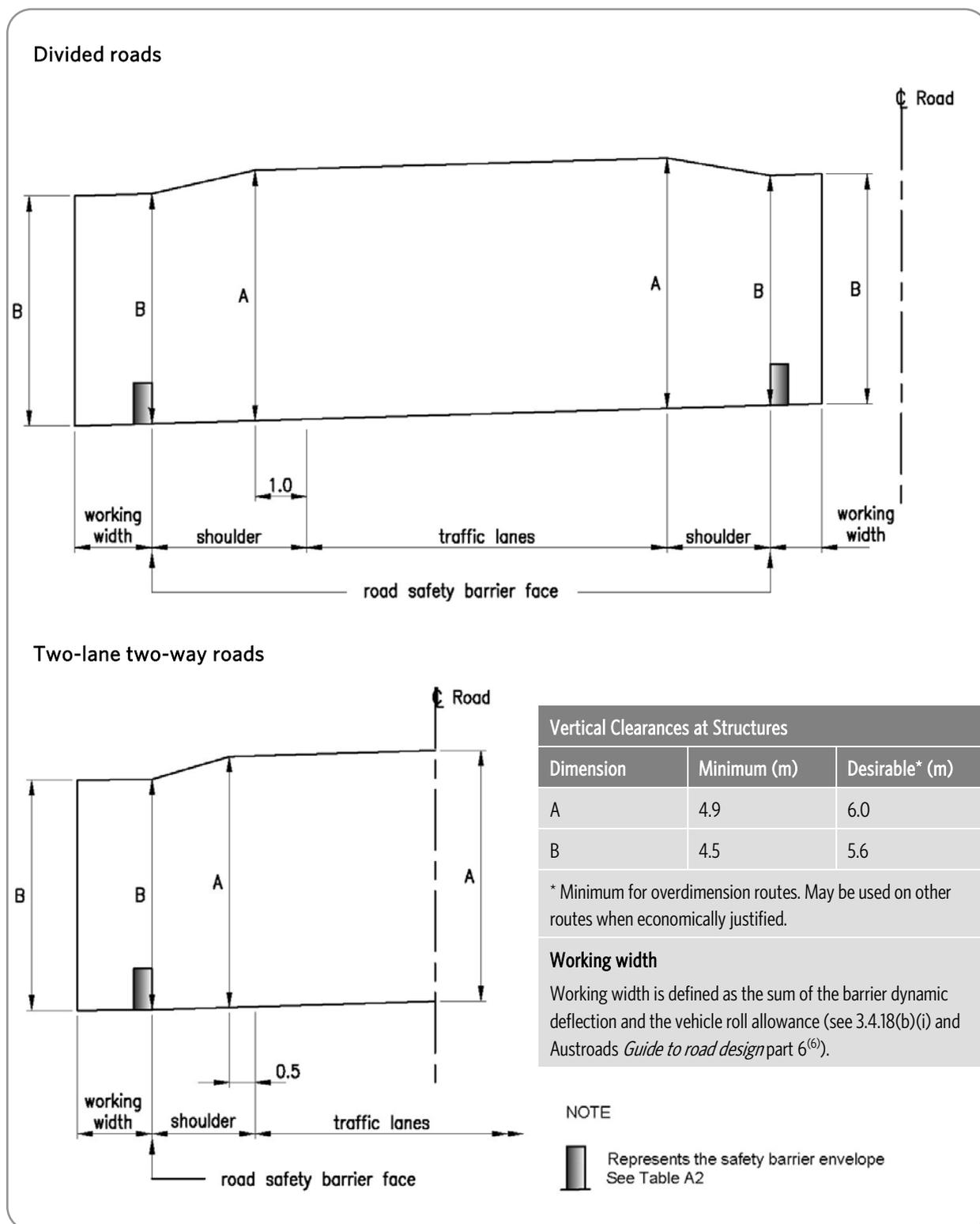
Notes:

- Traffic volumes are expected AADT 30 years ahead.
- See notes associated with table A5.

A3 Vertical and horizontal clearances

Vertical and horizontal clearances at all overhead or adjacent obstructions shall conform with figure A4.

Figure A4: Vertical and horizontal clearances



A3 continued

Notes to figure A4:

1. Where the NZTA has resolved that a state highway, or part of a state highway, is an overdimension load route, to allow for the passage of overdimension loads, all new structures crossing the route shall provide a minimum vertical clearance of 6.0m over a carriageway width of at least 10.0m. The effects of truck tracking on curves shall also be allowed for.
 2. All overhead clearances shall be measured vertically.
 3. Lateral clearances shall also be checked for sight distance on curved alignments.
 4. Overhead clearances to footpaths shall be as large as practical, but not less than 2.5m.
 5. Design vertical clearances given in figure A4 shall be increased where appropriate to make provision for settlement and road surfacing overlays. As a guideline, provide a minimum of 100mm more than the design vertical clearance where an overlay is anticipated.
 6. Where a barrier is not required, the working width dimension shall be replaced by a distance of 1.5m (urban) and 2.0m (rural).
 7. Vertical clearances at pedestrian bridges shall be:
 - a. At least 200mm greater than adjacent traffic bridges, but not less than 5.1 m.
 - b. At least 6.2m where there are no adjacent traffic bridges over the road crossed by the footbridge between the footbridge and roads or ramps intersecting the underlying road.
 8. For bridges over railway lines, Kivirail (the New Zealand Railways Corporation) shall be consulted on their requirements for any particular site location.
-

A4 References

- (1) Austroads (2010) *Guide to road design*. Part 3 Geometric design, AGRD03-10. Sydney, NSW, Australia.
 - (2) Austroads (2014) *Austroads glossary of terms*, AP-C87-14. Sydney, NSW, Australia.
 - (3) Austroads (2009) *Guide to road design*. Part 6A Pedestrian and cyclist paths, AGRD06A-09. Sydney, NSW, Australia.
 - (4) Highways Agency (2005) TA 91/05 *Provision for non-motorised users*. TSO, London, United Kingdom.
 - (5) Highways Agency (2005) TA 90/05 *The geometric design of pedestrian, cycle and equestrian routes*. TSO, London, United Kingdom.
 - (6) Austroads (2010) *Guide to road design*. Part 6 Roadside design, safety and barriers, AGRD06-10. Sydney, NSW, Australia.
-